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SPECIFICATION FOR OPTICAL BENCH (ADVANCED TYPE)

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Indian Standard

SPECIFICATION FOR OPTICAL BENCH (ADVANCED TYPE)

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 January 1975, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Optical bench is a mechanical set up used for checking optical components/instruments and for laying out optical systems accurately. The bench essentially consists of a heavy metallic lathe type bed with sliding carriages and accessories for holding various components. A scale fixed on one side of the bed enables reading of the positions of the carriages. The advanced type optical bench is of sturdier construction, much more accurate and supplied with a larger number of carriages and accessories.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the general and functional requirements of advanced type optical bench.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Bed — A heavy metallic casting of lathe type on which the sliding carriages and accessories travel smoothly.

2.2 Sliding Carriages — Carriages which slide over the bed and are used for mounting various accessories.

3. GENERAL REQUIREMENTS

3.1 Each part of the optical bench shall be made from material of suitable strength and shall be suitably finished.

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*Rules for rounding off numerical values (*revised*).

3.2 Fitting of components shall be proper and there shall be no play between two mating components.

3.3 Bed

3.3.1 The bed shall be thoroughly seasoned and properly aged before manufacture. It should be specially heat treated between machining operations to relieve casting stresses. It shall be designed to provide adequate stability free from tremor and development of any warping and twist effect.

3.3.2 The entire upper surface of the bed shall be machined and ground well and accuracy guaranteed to 0·06 mm over its entire length.

3.3.3 The effective length of the bed shall have the value between 100 to 300 cm. In special cases the effective length may be varied to suit the requirements.

3.3.4 The scale, made preferably of stainless steel, shall be rigidly fixed to the upper surface of the bed. The scale shall be marked at each millimetre and figured after each centimetre, with half centimetre lines extended.

3.3.5 The scale shall be machine divided in millimetres to the entire length and shall be accurate to within ±0·001 percent at 27°C.

3.3.6 Four levelling screws shall be provided with rest plates.

3.4 Carriages

3.4.1 Six sliding carriages shall be provided to carry the standard experimental accessories. All the carriages shall have slow movement along the bed with vernier reading to 0·1 mm in addition to the quick motion.

3.4.2 The under surfaces of the saddles shall be accurately machined and interground well with the bed surface.

3.4.3 Each carriage shall be provided with a vernier to read its position along the main scale accurate to 0·1 mm.

3.4.4 Scale and vernier shall be provided to reach the transverse movement accurate up to 0·1 mm.

3.4.5 The truly cylindrical metal tube of carriage shall be able to take and lock in the required position the stem of various accessories mounted in it. All stems shall be interchangeable and shall be of 13 mm diameter with a tolerance of h6 according to IS : 919-1963*.

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*Recommendations for limits and fits for engineering (*revised*).

3.4.6 Height of the two of the sliding carriages shall be adjustable by operating a knurled head knob. Vertical slow motion shall be provided with a total vertical movement of 25 mm, fitted with an arrangement capable of reading the slow motion to 0·25 mm.

3.4.7 Carriages shall be able to be clamped in any position on the bed by operating a knurled head knob.

3.4.8 One of the carriages shall be provided with the facility for rotary motion as well as slow motion along the bed. The circular scale shall be graduated in single degrees and numbered at every ten degrees interval. A reference mark shall also be provided on the carriage.

3.4.9 One of the carriages shall be provided with a transverse slide movement by a micrometer screw with vernier reading to 0·1 mm, in addition to quick motion along the bed.

3.4.10 Two of the carriages shall have their tubes off set from the centre, in one to the right side and in the other to the left side, along the bed to reduce separation distance between two mounted accessories. The distance from the edge of the carriage to the nearest side of the tube shall be 10 mm.

4. FUNCTIONAL REQUIREMENTS

4.1 Movement of the levelling screws shall be smooth.

4.2 Clamping knobs shall be such that they do not cause any strain on the clamped parts.

4.3 Locking system shall be such that the stems of various accessories do not slide down when locked up in the tube of the saddle.

4.4 The internal diameter of the cylinderical tube of the carriage shall be 13·5 mm with a tolerance of H7 according to IS : 919-1963*.

4.5 Carriages shall not give any tilt or shake in any direction when they slide over the bed. The height adjustment, rotatory motion, transverse motion and longitudinal motion mechanism provided in the carriages shall not cause any tilt in the various accessories fitted on the carriages.

4.6 There shall not be any tilt in the position of the carriages while clamping.

4.7 The various movements provided in the carriages and accessories shall be free from backlash.

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*Recommendations for limits and fits for engineering (*revised*).

5. ACCESSORIES

5.1 Six sliding carriages as specified under **3.4** shall be supplied as accessories. The various movements provided in these carriages shall be such that the error of movement causing tilt does not exceed ±5 minutes.

5.2 Lens holder, self centering, to hold lenses up to 6 cm diameter.

5.3 Iris diaphragm having apertures range between 5 mm to 50 mm, calibrated in intervals of 1 mm.

5.4 Nodal slide or holder for lenses, with independent centering adjustment and fitted with rack and pinion. The scale shall be graduated in 0·5 mm and shall read to 0·01 mm with vernier. Circular table rotating through 180° and graduated to 180° in single degrees. One needle, adjustable for height, shall also be fitted.

5.5 Holder for ground glass screen, mirror, filter, etc.

5.6 A lamp house with a centring arrangement for the filaments, a condensing system, iris diaphragm and slots for light filters shall be provided. The lamp house shall be provided with a baffle plate at proper place for shielding extraneous light.

5.7 Micrometer eyepiece 10X, fitted with a cross line graticule capable of transverse motion to 10 mm and reading to 0·01 mm with the help of a graduated drum.

5.8 V-support for telescope, microscope and collimator.

5.9 Nodal slide.

5.10 Table top for holding biprism, grating, etc.

5.11 Pin hole plate.

5.12 Adjustable slit with stem.

5.13 A collimator of 25 mm aperture and 175 mm focus with a cross line graticule.

5.14 A front surface mirror of 50 mm diameter.

6. TESTS

6.1 Fitting of each mating components shall be tested to ensure interchangeability.

6.2 The linear scale when compared against a certified metal scale shall not have a cumulative error exceeding ±0·5 mm for the entire graduated part of the scale.

6.3 The lateral shift in the sliding movement shall be tested and it shall be ensured that there is no such shift.

6.4 The movement of the carriages, as they move on the bed, shall be tested by an autocollimator (as in the case of lathe beds) with a mirror mounted on the carriages for parallelism of motion. The error shall not exceed ± 5 minutes.

7. MARKING

7.1 The maker's name or trade-mark, and the year of manufacture shall be legibly and indelibly marked in the central part of the bed of the optical bench.

7.1.1 The optical bench may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8. PACKING AND PACKAGING

8.1 A transparent cover shall be provided to protect the optical bench when not in use.

8.2 The optical bench shall be suitably packed for transit along with its accessories.

(*Continued from page* 2)

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3135-1965	Cathetometer
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3981-1965	Dimensions and marking of general purposes microscopes
4328-1967	Monocular dissecting microscope
4329-1967	Measuring (travelling) microscope
4381-1967	Pathological microscope
4382-1967	Non-tinted ophthalmic glass
5148-1969	Hand magnifiers (circular) 50 mm, 75 mm and 100 mm
5204-1969	Research microscope
5695-1970	Spectacle lenses
5706-1970	Spirit levels for use in precision engineering
5920-1970	Recommendations for the preparation of drawings for optical elements and systems
6425-1971	Dioptometer (lensometer)
6471-1971	Spectrometer (student type)
6472-1971	General requirements for tinted ophthalmic glass
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